

**Program Charter  
for  
Space Weather**

Program Manager: Ron Zwickl

Weather and Water Goal Team Lead: George Smith

## **1. EXECUTIVE SUMMARY**

### Program Description

NOAA's Space Weather Program monitors, measures, and specifies the space environment and provides timely and accurate **operational** space weather forecasts, warnings, alerts, and data to end users in the USA and around the world.

The Space Weather Program is an end-to-end program that:

- develops space weather observational requirements for NOAA's sensors
- ingests and processes NOAA data as well as data from other sources
- performs research to understand the processes that cause severe space weather
- transitions research into operations to improve services
- archives data from NOAA and the Department of Defense (DoD) and makes it accessible to customers
- operates an education, outreach, and environmental literacy program.

The Space Weather Program falls under NOAA's Weather and Water Mission Goal and depends on data obtained from the Satellite Sub-Goal. In addition to non-NOAA Customers, the Space Weather Program provides space weather data, forecasts, alerts and warnings to the Satellite Sub-Goal, the Climate Goal, and the Commerce and Transportation Goal.

NOAA's Space Weather Program <http://www.sec.noaa.gov> and <http://www.ngdc.noaa.gov> is a matrixed program cutting across several line offices and programs. Direct program funding flows through NOAA's National Weather Service (NWS) to the Space Environment Center (SEC) which is part of the National Centers for Environmental Prediction (NCEP), through NOAA's National Environmental Satellite, Data, and Information Service (NESDIS), to the National Geophysical Data Center (NGDC) and through NOAA OFA, for Boulder Facilities Operations.

The Space Environment Center and the Solar Terrestrial Division of NESDIS/NGDC are direct components of the Space Weather Program; in addition, the NOAA Marine and Aviation Operations (NMAO) provide staff (NOAA Corp Officers); NOAA's National Ocean Service (NOS), National Geodetic Survey (NGS); and the Satellite Services Program provide data. Outside NOAA, the United States Air Force (USAF) is an especially strong partner that provides services and data, and has staff detailed to SEC. NASA provides key science data from its research satellites and plans to provide science data from future approved missions. United States Geological Survey (USGS) provides key ground based data. The Space Weather Program receives data from many countries throughout the world. Both SEC and NGDC are located in Boulder, Colorado.

*Other Non-NOAA links:* NOAA is a strong partner in the *National Space Weather Program*, which coordinates space weather activities across its seven member agencies including: the Department of Commerce (DOC), the Department of Defense (DoD), the National Science Foundation (NSF), the National Aeronautics and Space Administration (NASA), the Department of Interior (DOI), the Department of Transportation (DOT), and the Department of Energy (DOE). NOAA is the lead partner of the *International Space Environment Service* (ISES), the body responsible under the *International Council for Science* (ICSU) for coordinating the worldwide provision of space weather services.

*Direct customers of NOAA's Space Weather Program:* Customers include power grid operators, satellite operators, radio communicators, Global Positioning System (GPS) and Long Range Navigation (LORAN) users, aviators, and other agencies such as DoD, DOT, DOE, Homeland Security, and NASA.

## **2. PROGRAM REQUIREMENTS**

### **A. Requirement Drivers**

- *NOAA Reorganization Plan No. 2 of 1965 (79 Stat. 1315, July 13, 1965); and Reorganization Plan No. 4 of 1970 (84 Stat. 2090, October 3, 1970);* There is clear Congressional intent for a single, focused national program for space weather activities. Historically, these activities were carried out by the Department of Commerce and other entities, which were subsequently folded into NOAA, through the Reorganization Plans.
- *15 U.S.C. § 1532;* authorizes the Department to conduct research on all of the telecommunications sciences, including wave propagation and reception, the conditions which affect electromagnetic wave propagation and reception, electromagnetic noise and interference, radio system characteristics, operating techniques affecting the use of the electromagnetic spectrum, and methods for improving the use of the electromagnetic spectrum for telecommunications purposes.
- *Data Quality Act, Public Law 106-554, Section 515 (2001);* Required the Office of Management and Budget to promulgate guidance to agencies ensuring the quality, objectivity, utility, and integrity of information (including statistical information) disseminated

by Federal agencies. Required Federal agencies to publish their own agency specific guidelines. NOAA guidelines: <http://www.noaanews.noaa.gov/stories/iq.htm>

- *NOAA Administrative Order 212-15 (Dec. 22, 2003); Management of Environmental and Geospatial Data and Information.*
- *FEMA Federal Preparedness Circular (FPC) 60; The document has been updated – Federal Preparedness Circular (FPC) 67 “Acquisition of Alternate Facilities for Continuity of Operations (COOP),” (April 30, 2001). - The [National Response Plan](#) (NRP) establishes a comprehensive all-hazards approach to enhance the ability of the United States to manage domestic incidents. The Federal Response Plan (FRP) tasks the Department of Commerce (DOC) with acquiring and disseminating weather data, forecasts, and emergency information, providing information on natural resources, predicting pollution movement, and providing information on meteorological, hydrological, ice, and oceanographic conditions.*
- *Homeland Security Presidential Directive/HSPD-5; Subject: Management of Domestic Incidents (Feb. 28, 2003).*
- *33 U.S.C. § 883e, Agreements for surveys and investigations; - Authorizes agreements, including receipt and expenditure of funds, for surveys or investigations or for performing related surveying and mapping activities, including special-purpose maps, and for the preparation and publication of the results*

## **B. Mission Requirements**

- *Continuously monitor, measure, and specify the space environment as outlined in the NOAA Reorganization plan No. 2 of 1965, FEMA Federal Preparedness Circular (FPC) 60, Homeland Security Presidential Directive, 33 U.S.C. § 883e).*
- *Provide timely and accurate space weather data, operational forecasts, alerts, and warnings of hazardous space weather phenomena as outlined in the NOAA Reorganization plan No. 2 of 1965, FEMA Federal Preparedness Circular (FPC) 60, and Homeland Security Presidential Directive, 33 U.S.C. § 883e).*
- *Provide scientific stewardship of, and public access to, space weather data and products as outlined in the Data Quality Act, Public Law 106-554, Section 515 (2001), NOAA Administrative Order 212-15 (Dec. 22, 2003), 33 U.S.C. § 883e).*
- *Understand the processes that influence space weather and develop applications for the user community as outlined in the NOAA Reorganization Plan No. 2 of 1965 (79 Stat. 1315, July 13, 1965); and Reorganization Plan No. 4 of 1970 (84 Stat. 2090, October 3, 1970), 15 U.S.C. § 1532, Data Quality Act, Public Law 106-554, Section 515 (2001), NOAA Administrative Order 212-15 (Dec. 22, 2003), FEMA Federal Preparedness Circular (FPC) 60, 33 U.S.C. § 883e, Agreements for surveys and investigations).*
- *Develop new and improved products and transition them into operations to meet evolving space weather user needs as outlined in the NOAA Reorganization Plan No. 2 of 1965*

(79 Stat. 1315, July 13, 1965); and Reorganization Plan No. 4 of 1970 (84 Stat. 2090, October 3, 1970), 15 U.S.C. § 1532, Data Quality Act, Public Law 106-554, Section 515 (2001), NOAA Administrative Order 212-15 (Dec. 22, 2003), FEMA Federal Preparedness Circular (FPC) 60, 33 U.S.C. § 883e, Agreements for surveys and investigations).

### **3. LINKS TO THE NOAA STRATEGIC PLAN**

#### **A. Goal Outcomes**

- Space Weather Program contributions support Weather and Water Goal outcomes from the NOAA Strategic Plan by:
  - \*Reducing loss of life, injury, and damage to the economy
  - \*Improving decisions with more valuable space weather information
  - \*Increasing customer satisfaction with timely and accurate space weather forecasts, warnings, alerts, and data.
- Space Weather Program contributions support the Commerce and Transportation Goal Outcomes from the NOAA Strategic Plan by: Supporting safe, secure, efficient, and seamless movement of goods and people in the US transportation system
- Space Weather Program contributions support the Climate Goal Outcomes from the NOAA Strategic Plan by: Supporting a predictive understanding of the global climate system on time scales of weeks to decades with quantified uncertainties sufficient for making informed and reasoned decisions

#### **3. Goal Performance Objectives:**

- Space Weather Program contributions support the following Weather and Water Performance Objectives by:
  - Increasing lead time and accuracy for weather and water warnings and forecasts
  - Improving predictability of the onset, duration, and impact of hazardous and severe weather and water events
  - Increasing development, application, and transition of advances in science and technology to operations and services
  - Increasing coordination of weather and water information and services with integration of local, regional, and global observation systems
  - Reducing uncertainty associated with weather and water decision tools and assessments
  - Enhancing environmental literacy and improving the understanding, value, and use of weather and water information and services.

---

Space Weather Program contributions support the following Commerce and Transportation Performance Objectives by:

- Enhancing navigational safety and efficiency by improving information products and services
- Improving accurate positioning capabilities, that produce national economic, safety, and environmental benefits

Space Weather Program contributions support the following Climate Goal Performance Objectives by:

- Describing and helping to understand the state of the climate system through integrated observations, analysis, and data stewardship

### **C. Goal Strategies**

Space Weather Program contributions support the following Weather and Water Strategies from the NOAA Strategic Plan by:

- Improving the reliability, lead-time, and effectiveness of weather and water information and services that predict changes in environmental conditions
- Integrating an information enterprise that incorporates all stages from research to delivery
- Providing better coordination of employee skills and training
- Developing and infusing research results and new technologies to improve products and services, streamline dissemination, and communicate vital information more effectively.
- Working with private industry, universities, and national and international agencies to create and leverage partnerships that foster more effective information services.
- Building a broad-based and coordinated education and outreach program by engaging individuals in continuous learning toward a greater understanding of the impacts of space weather on their lives.
- Employing scientific and emerging technological capabilities to advance decision-support services and educate stakeholders.

Space Weather Program contributions support the following Commerce and Transportation Strategies from the NOAA Strategic Plan by:

- Expanding and enhancing advanced monitoring and observational capabilities to provide accurate, up-to-date information.

- Developing and applying new technologies, methods, and models to increase the capabilities, efficiencies, and accuracy of transportation-related products and services.
- Improving decision making support for aviation, marine and surface navigation;
- Enhancing public understanding of space weather science and technology through outreach, education, and industry collaboration.

Space Weather Program contributions support the following Climate Goal Strategies from the NOAA Strategic Plan by:

- Providing data and analysis to improve the quality and quantity of climate observation, analysis, interpretation, and archive.

#### **4. PROGRAM OUTCOME(S)**

- Improved public safety and social and economic benefits from the application of space weather information and services to industry, academia, and other government agencies security
- Informed social and policy decisions in the areas affected by space weather

#### **5. PROGRAM ROLES AND RESPONSIBILITIES**

This program is established and managed with the procedures established in the NOAA Business Operations Manual (BOM). Responsibilities of the Program manager are described in the BOM. Responsibilities of other major participants are summarized below:

##### **A. Participating Line Office, Staff Office, and Council Responsibilities:**

1. *Space Environment Center (SEC)* located in the National Weather Service, National Centers for Environmental Prediction, is responsible for providing timely and accurate operational space weather forecasts, warnings, alerts, and data to stakeholders, customers, and end users in the USA and around the world. SEC develops space weather observational requirements for NOAA's sensors, ingests and processes their data, performs research to understand the processes that cause severe space weather, and transitions research into operations to improve services.
2. *National Geophysical Data Center (NGDC)*, within NESDIS, is responsible for scientific stewardship of the archive of NOAA's space weather data and products and makes their holdings available to the public. NGDC also archives and makes available some DoD space weather data.
3. NOAA's National Environmental Satellite, Data, and Information Services (NESDIS) is responsible for providing needed NOAA satellite platforms with space environment sensors and their data, and data from tracking non-NOAA satellites.

4. NOAA General Counsel is responsible for providing legal services necessary to enable the program to discharge its duties.
5. NOAA's National Ocean Service, National Geodetic Survey (NOS/NGS) is responsible for providing the dual frequency GPS data from the CORS network (500 Continuously Operating Reference Stations).
6. NOAA's Marine and Aviation Operations (NMAO) is responsible for NOAA Corps staffing at SEC, at NGDC and at the Air Force Weather Agency at Offutt Air Force Base, Omaha, NE.
7. NOAA Observing Systems Council provides to the Program and NOAA Leadership guidance and recommendations on Observing Systems and data management strategies and, in particular, on integrating observing systems and data management strategies into the Global Earth Observing System of Systems (GEOSS).
8. NOAA Research Council provides to the Program and NOAA Leadership guidance and recommendations to ensure that research is sufficient, of high quality, and appropriate for product improvement; also, for policy regarding the transition of research into operations.
9. NOAA IT Council provides leadership and guidance to ensure that NOAA's Information Technology (IT) meets security guidelines and is managed responsibly.
10. NOAA Education Council is the primary forum within the agency for the discussion of ideas and proposals for NOAA-wide education and outreach activities and priorities; and, makes recommendations on education matters to NOAA leadership

### **B. External Agency/Organization Responsibilities**

#### 1. Department of Defense (DoD):

##### *United States Air Force (USAF):*

- *Air Force Weather Agency:* provides liaison staff to the joint NOAA-USAF Forecast Center, provides solar and ionospheric observations, and funds space weather research.
- *Other USAF organizations:* Air Force Office of Scientific Research, Air Force Combat Climatology Center, Air Force Research Laboratory and Space Command work jointly with the Space Weather Program on space weather activities.

##### *United States Navy:*

- *Office of Naval Research:* funds projects whose deliverables are destined for implementation in NOAA and DoD.



2. *National Aeronautics and Science Administration (NASA)*: provides data from its research satellites to SEC and funds competitively won grants for space weather research.

3. *International Space Environment Service (ISES)*: coordinates the worldwide provision of space weather services; the 11 Regional Warning Centers (Sweden, Poland, Czech Republic, Russia, China, India, Japan, Australia, United States, Canada, and Belgium) supply data and suggested forecasts to the ISES World Warning Agency at NOAA, which makes the daily global forecast for ISES. The European Space Agency is a collaborative expert center in ISES, providing data and product exchange for activities in Europe.

4. *National Science Foundation (NSF)*: provides competitively won grants in space weather research.

5. *Department of Energy (DOE)*: Los Alamos National Laboratory provides data from its monitoring satellites and does research, which guides product improvements in space weather.

6. *Department of Transportation (DOT)*: FAA is responsible for regulating commercial aviation and commercial space transportation safety regarding hazards related to space weather.

7. *Department of Interior (DOI)*: provides ground-based data essential for detection and prediction of geomagnetic storms.

8. *Department of Homeland Security (DHS)*: uses space weather information to help assess whether events are environmentally induced or result from hostile acts.

9. *National Space Weather Program (NSWP)*: chartered under the Federal Committee for Meteorological Services and Supporting Research (FCMSSR) and administered by the Office of the Federal Coordinator for Meteorology (OFCM), coordinates and leverages the space weather efforts of seven (**DOC, DoD, NSF, DOI, NASA, DOT, DOE**) federal agencies; guides high level policy decisions as they relate to space weather.

10. *Industrial Space Weather*: provides tailored space weather services to customers.

11. *Academia*: provides a broad range of basic and applied research resulting in an advanced understanding of the space environment.

12. *European Space Agency (ESA)*: provides data and operates a web site in Europe, which “mirrors” NOAA’s Space Weather Web site.

13. *European Organization for the Exploitation of Meteorological Satellites (EUMETSAT)*: will provide space weather data identical to those from NOAA polar orbiting satellites.



**6. END USERS OR BENEFICIARIES OF PROGRAM**

1. *Electric Power Grid Operators*: use geomagnetic storm detection and warning system to maximize power grid stability and to mitigate power grid component damage and large-scale blackouts during severe geomagnetic storms.
2. *Spacecraft Launch Operators*: use radiation products to avoid electronic problems leading to launch vehicles going off course and being destroyed or misplaced.
3. *Spacecraft Operations and Design*: rely on space weather products to ensure spacecraft survival from electronic problems.
4. *Manned Spaceflight*: activities are altered to avoid or mitigate effects of radiation storms that impact crews and technological systems.
5. *Navigation Systems*: users need space weather data as a critical input to ensure the integrity and safe use of electronic (i.e., GPS, Loran) based navigational systems.
6. *Aviation*: uses crucial information on space weather impacts, such as communication outages, potentially harmful radiation, and navigation errors to adjust routes and altitudes.
7. *Communications Operators*: anticipate and react to space weather over a wide range of communications frequencies used by emergency management officials, search and rescue systems, and many others.
8. *Surveying and Drilling*: rely on accurate and timely space weather data for safe and efficient high-resolution land surveying and sea drilling.
9. *Academia*: uses NOAA's extensive database of real-time and archived space weather data to support worldwide research efforts and space weather model development.
10. *General Public*: is interested in NOAA's space weather monitoring and warning system to support operational products and education/outreach initiatives.

---

**Appendix A**  
**Other Goals and Programs with links**  
**To**  
**Space Weather Program**

**Climate Goal**

Climate Observations and Analysis

**Weather and Water Goal**

Local Forecast and Warnings

Environmental Modeling

**Commerce and Transportation Goal**

Aviation Weather

Geodesy

**Critical Support Goals**

*Satellite Services Sub-goal:*

Geostationary Satellite Acquisition

Polar Satellite Acquisition

Satellite Services

*Leadership Sub-goal:*

NOAA Headquarters

Line Office Headquarters

Homeland Security

*Mission Support Sub-goal:*

Administrative Services

Financial Services

Workforce Management

Acquisition and Grants

Information Technology Services

Facilities